Linnaeus' Type Specimens of Cowries

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The cowrie shells belonging to the collection of Linnaeus are preserved in the cabinet of the Linnean Society of London. They have been discussed twice in detail, *viz.* by Hanley (1855) and by Dodge (1953). However, both conchologists have restricted their studies to investigations into the specific identity of Linnaeus' specimens with the species credited by later writers to be the species established by Linnaeus. Hanley compared Linnaeus' shells with illustrations in then modern monographs, as of Sowerby (1828, 1832 - 1837), Kiener (1843 - 1845), Reeve (1845 - 1846), etc., and Dodge compared recent microfilm reproductions of the specimens preserved in the Linnean Society of London with shells which usually are named with specific names established by Linnaeus, with exhaustive remarks on bibliography, taxonomy, etc., of each species. But generally neither Hanley nor Dodge published the measurements and exact descriptions of the specimens which would allow to recognize the variety or even the geographical race (Schilder & Schilder, 1938 to 1939) to which Linnaeus' shells belong.

In March 1936 I was permitted to study the cowries of Linnaeus then preserved in the cabinet of the Linnean Society of London: each specimen belonging to Triviacea (Triviidae) and to Cypraeacea (Cypracidae and Ovulidae) has been carefully examined with regard to the probability that it might belong to Linnaeus' original type specimens; and each shell has been measured accurately and described in exhaustive notes, especially with regard to characters which point to its belonging to a geographical race or ecological variety. Now, after 30 years, when approaching my seventieth birthday, I think that it is high time to publish these data so that Linnaeus' type specimens will be described as accurately as necessary; I think that these descriptions of essential details will explain the individual characters of the shells in a better way than the most exact photographs could do.

For though we cannot be absolutely sure that the specimens preserved in Linnaeus' collection really are the same shells which Linnaeus faced when he composed his descriptions, there is a **probability** in different degrees that it was so. Several species rare in Linnaeus' time are represented by only one specimen in his cabinet, other descriptions agree with a specimen in such a way that it is most improbably a later replacer for a similar shell removed from the collection. Hanley has added the specific names cut out from his publication (1855); besides, many shells wear a pasted oval label (about 1 cm across) which is inscribed with a number in very antique figures: these figures evidently written by Linnaeus himself mostly correspond to the number of the species enumerated in the 12th edition of his Systema Naturae (1767), some few to the tenth edition (1758) while several other figures are incomprehensible.

According to art. 61 and to recommendation 73 A of the International Rules of Zoological Nomenclature it seems to be desirable that type specimens of all species should be fixed; this tendency chiefly refers to the species established by Linnaeus and Lamarck which often have been divided into several species or subspecies by later authors. Therefore I selected from Linnaeus' specimens the most fitting shells as type specimens, and I propose to treat and label them as holotypes (art. 73 a), lectotypes (art. 74 a), or neotypes (art. 75) respectively:

a) If there is only one specimen of a species preserved in Linnaeus' cabinet it should be treated as a **holotype** even if the oval label is missing.

b) If there are two or more specimens which most probably were represented in the cabinet in Linnaeus' times, the specimen most closely fitting in characters and condition should be selected as **lectotype**, in any case a shell wearing the oval label; the other shells may or may not be called paralectotypes (art. 74 E).

c) If there are several specimens which may or may not be Linnaeus' original shells, the most fitting specimen should be selected as **neotype**, as it is more probable that Linnaeus described the species using as prototype one of these specimens than a shell preserved in a foreign collection, though there is one exception: therefore, if one decides to select a neotype, one should prefer a shell preserved in Linnaeus' collection rather than a shell preserved elsewhere.

In the following paragraphs, the cowrie species established by Linnaeus have been arranged according to the numbers added in the twelfth edition of Systema Naturae (1767) followed by the two species published only in the Mantissa (1771). In the heading the name given by Linnaeus is followed by the numbers added both in the tenth (1758) and the twelfth (1767) edition. The description of each species begins with the proposed typological status, and, where applicable, the number entered on an oval label; it is followed by the generic and specific name used in our recent papers, and a formula indicating size, shape, and dentition, *e. g.* 755/58 38:34, in which 755 indicates the length in tenths of a mm (*i. e.* 75.5 mm), 58 the breadth in per cent of the length, 38 the number of labial teeth, and 34 the number of columellar teeth, the anterior columellar ridges excluded.

Cypraea exanthema (—, 325)

Lectotype (label 325): *Macrocypraea zebra* syn. *exanthema*, 755/58 38:34, spire projecting, columellar teeth short, fossula and columellar sulcus well developed; fawn, hardly darker around the spire, spots large, white, the lateral ones with a reddish brown center.

Second shell: 760/51, color more saturate, spots smaller.

Cypraea mappa (285, 326)

Lectotype (label 326): *Mauritia mappa,* 685/60 36:29, margins and base rather callous, inner lip acuminate and bent to the left on the rear; dorsal markings regular, of medium shade, spire blotch very large, lateral spots scarce, the right ones rather large and dark brown, the left ones smaller and paler, base very pale pinkish, columellar central blotch large, pale, purplish grey, but very distinct, teeth orange within the aperture only. The shell probably belongs to the Pacific race.

Second shell: 807/64, very similar, but still more callous, lateral spots large, base suffused with pink, columellar blotch and aperture more vividly colored. The shell is rather fresh so that it possibly has been added after Linnaeus' time.

Cypraea arabica (286, 327)

Lectotype (label 327): *Mauritia arabica,* 699/59 34:30, outer lip narrowly margined, base flat, terminal ridge oblique; dorsal striae prevailing over the pale lacunae, spire blotch absent, lateral spots rather small, base pale flesh color, teeth rusty brown. The shell evidently belongs to the Indian race called *dilacerata* Schilder & Schilder (1939, p. 183).

Second shell: 655/60, dorsal striae more dilacerate, pale, lateral spots scarce; evidently also *dilacerata.*

Third shell: 580/59, more saturate, dorsal striae and lacunae rather confused, lateral spots much larger; the shell recalls the Malayan and Pacific races of *arabica.*

Cypraea argus (287, 328)

Holotype (no label): *Lyncina argus,* 827/51, subzonate, dorsal rings very distant, mostly small with few larger and thicker (but not doubled) ones intercalated; the base and the teeth could not be examined as the shell is fastened to the tray.

Cypraea testudinaria (288, 329)

No specimen was represented in Linnaeus' collection, even not in Hanley's time (1855).

Cypraea stercoraria (289, 330)

Holotype (label 330): *Trona stercoraria,* 592/63 30:22 (two terminal ridges and two intercalated anterior ribs excluded), rather oblong, right margin narrow and acutely margined, fossula very broad and concave, ribbed, with 9 inner denticles, columellar sulcus narrow, ribbed; dorsal spots small, slightly confluent but distinct, spire blotch rather large, lateral spots small, rather confused and suffused with grey. The shell the anterior extremity of which is damaged, evidently belongs to the oblong, basally flattened ecological variety called *conspurcata* (Gmelin) in my papers.

Cypraea carneola (290, 331)

There are five shells which Hanley (1855, p. 183) declared not to be Linnaeus' types; nevertheless, I propose to select the

Neotype (no label): *Lyncina carneola,* 327/64, rather deltoidal with thickened margins, greyish red with a distinct lilac ring.

Two other specimens (250/70 and 373/63) are very similar in shape and color, and a fourth (380/64) is a younger shell of the same small callous variety, while a fifth shell (695/60) which is quite calcified by the well known "disease" of old, not ventilated shells looks rather like *Lyncina leviathan* Schilder & Schilder.

Cypraea zebra (291, 332)

Lectotype (label 332): *Macrocypraea zebra* (*i.e.* a young stage of *exanthema*), 751/54 (31):36, spire very projecting, fossula very broad and concave, but still rather smooth, columellar sulcus still very shallow but crossed by very regular ribs, the terminal labial teeth are not yet developed; pale grey with purplish grey-brown zones, outer lip becoming fawn, teeth dark brown.

A second shell (760/56) is slightly less young, as the fossula is ribbed, shell thinner, paler, more yellowish.

The characters of the spire, the fossula, and the columellar sulcus prove both shells to be juvenile stages of *exanthema* and exclude them from being young *cervus* (LINNAEUS) or *cervinetta* (KIENER).

Cypraea talpa (292, 333)

Lectotype (label 333): *Talparia talpa*, 707/48 47:38 (plus 5 ribs within the posterior outlet), right side narrowly margined, fossula very broad, ribbed, but with the inner denticles hardly thickened, columellar sulcus narrow in front, but obsolete behind; dorsum with four rather saturate zones, base dark chestnut.

A second shell (812/51) bears no label.

Cypraea amethystea (293, 334)

Lectotype (label 334): *Mauritia arabica*, 485/62 30:24, right margin thickened, but base flattened, aperture narrow, dilated in front, hardly curved behind, terminal ridge obliquely produced, central columellar teeth rather produced; dorsum ground and polished so that it became violet (brownish in the centre) and the usual striae and lacunae are hardly recognizable above the margins, but the spire blotch evidently was absent; lateral spots blackish, numerous, large but not confluent, base yellowish white, teeth rusty brown. The thickness of the margins (more approaching the Pacific race than the Indian *dilacerata*) prove *amethystea* (incorrectly spelled *amethystina* by HANLEY) to belong to *arabica* and not to *histrio* (GMELIN), as I conjectured from the figures and habitat indicated by LINNAEUS (see SCHILDER, 1966, p. 199, note 7).

The second shell (with an oval label without number) must not be regarded as paralectotype as it totally lacks the typical character which consists in the violet dorsum: it is a *Mauritia arabica*, 422/65 25:25 with similarly thickened margins, and slightly convex base; the dorsum, however, shows the rather dark striae and pale lacunae, but no spire blotch, the lateral spots are similar to the lectotype, but more confluent, base pale yellowish. This shell which evidently belongs to the Malayan-Pacific race of *arabica*, may have been added erroneously to the lectotype which should be better called holotype.

Cypraea lurida (294, 335)

Holotype (no label): *Luria lurida*, 370/59 (teeth not countable as the shell is fixed on the tray), pyriform, quite calcified so that the color is no longer recognizable; but the shell undoubtedly is a not fully grown specimen of the Mediterranean race *lurida*.

Cypraea vanelli (295, 336)

Holotype (label 336 in very old ink): juvenile *Lyncina lynx*, 255/62 24:19, labial teeth very short; dorsum greyish white, with irregular fulvous brown specks and spots which partially are arranged in transverse rows, terminal spots still indistinct, interstices of columellar teeth brownish orange.

Cypraea lota (296, 337)

The only specimen (label 337) should not be regarded as holotype, as HANLEY (1855, p. 185) stated that LINNAEUS' type specimen is preserved in the Dronningen Museum at Uppsala. The London specimen is a juvenile *Erosaria spurca*, 229/65 20:14, spire slightly projecting (three whorls and three and a half subsequent whorls), labial teeth very short, saw-like, columellar teeth short, nodulous (the terminal ridge and the hindmost rib excluded), fossula without inner denticles; very pale yellowish, margins with one row of rusty yellow spots. The shell is very similar to *Bulla cypraea* (see below).

Two other juvenile shells of *Erosaria spurca* (length 233 and 269, brownish fulvous) seem to have been put in the box later on.

Cypraea fragilis (297, 338)

Neotype (no label): juvenile *Mauritia arabica*, 441/62 30:24 (+ 4 denticles along the posterior outlet), cylindrical, teeth obsolete, hardly countable; greyish white with fulvous brown zones of usual shape. This junior shell evidently belongs to *M. arabica* (probably the Indian race *dilacerata*) as no other *Mauritia* agrees with its characters.

A second shell (380/62) is similar in shape, but totally calcified.

Cypraea caput serpentis (298, 339)

Holotype (label 298): *Erosaria caputserpentis*, 323/74 17:13, normally dilated specimen with the base flattened, but showing a rounded callosity in the center of the inner lip, aperture narrow, slightly curved behind; dorsum with white dots partly confluent to stars, posterior extremity orange, margins dark brownish grey, outer half of the base yellowish grey, inner half and the interstices of teeth white. Probably belonging to the Malayan race.

Two other shells (339/77 and 342/75) are paler fawn and evidently have been put into the box at a later date.

Cypraea mauritiana (299, 340)

Lectotype (label 340): *Mauritia mauritiana*, 703/72 27:22 (two terminal ridges and one intermediate rib

excluded), structural characters normal; dorsum with large lacunae (exposing the zigzag zones of the penultimate layer) and a central dorsal line, sides horny brown, edges and base greyish black, teeth dark chestnut, but becoming pale orange within the aperture.

A second shell which bears the label 34... in very old figures, is a young *Mauritia mauritiana* 515/62, with the margins still pale brown, the base greyish fulvous, and the teeth just beginning to become orange; it could be regarded as paralectotype, but LINNAEUS' description fits the lectotype only.

Cypraea vitellus (300, 341)

Lectotype (label 341): *Lyncina vitellus,* 422/66 26:20, base rather callous; dorsum greyish brown, with normal white spots, the lateral striae cross two thirds of the dorsum. The shell recalls the Malayan race.

Paralectotype (label 341): 408/63 2+24:20, not fully grown and rather more pinkish brown than the lectotype.

Cypraea mus (301, 342)

No specimen was represented in LINNAEUS' collection, evidently not even in HANLEY's time (1855).

Cypraea tigris (302, 343)

Lectotype (label 343): *Cypraea tigris,* 706/71 24:23 and the

Paralectotype (label 343): 697/69 25:23, both are almost identical with regard to the thickened, angularly callous margins and their color: dorsum yellowish white, with brownish black spots of medium size, which are surrounded by rusty and greyish blue shadows, dorsal line reddish brown. They recall Pacific varieties. The selection of the lectotype is quite arbitrary.

Cypraea lynx (303, 344)

Lectotype (label 344): *Lyncina lynx,* 280/61 1+20: 15, regularly ovate with the extremities attenuated, sides thickened but not margined, basal carina of the inner lip well developed; dorsum pale fulvous with confused purplish brown and rusty brown spots, suffused with a thin layer of purplish pink enamel, pale dorsal line indistinct, margins white with scarce dark spots, interstices of teeth orange.

This adult *Lyncina lynx* marked with the label 344 was in the same box as the holotype of *vanelli* marked with the label 336 (see above); besides, in another box, there were two additional adult *L. lynx* and two young shells, all without oval labels; they may be described as

Second shell: 368/61 22:21, callous, margined, dorsum pale fulvous with normal spots, suffused with greyish pink, and

Third shell: 505/48 25:20, subjunior, margins rounded, dorsum orange, rather confused, with irregular large blackish blotches.

The two junior shells measured 327 and 343.

Cypraea isabella (304, 345)

Lectotype (label 31): *Luria isabella,* 260/59 32:25, base callous, fossula concave with 7 inner denticles, columella smooth; dorsum fulvous with several rufous interrupted striae, margins white (reaching about one third of the dorsum), extremities with four distinct orange red spots without any trace of dark centers. Therefore the shell evidently belongs to the Indian race called *lemuriana* by STEADMAN & COTTON (1946).

There are also five shells with similar characters: 197/ 54 (anterior orange spots confluent), 200, 237 (subjunior), 280/56 (dorsal striae blackish), and 339; but they seem to have been added at a later time.

Cypraea onyx (305, 346)

Holotype (no label): *Erronea onyx,* 377/60 20:17, central part of the dorsum whitish (with three greyish zones shining through), surrounded by narrow pale chestnut bands which are separated by a pinkish grey zone from the dark chestnut margins of the shell, base almost black. These characters unmistakably point to the Malayan race *onyx.*

Cypraea clandestina (—, 347)

Neotype (no label): *Palmadusta clandestina,* 173/61 20:16, labial teeth produced over more than one third of the lip, columellar teeth only to one quarter, fossula vertical, crossed by wedge-shaped ribs which are not thickened on its inner border, columella smooth in the rear; dorsum with the usual tortuous yellowish grey markings and traces of orange zigzag lines, extremities white.

Three other shells possibly have been added at a later time: 177/62 20:16 (with much produced teeth and 2 or 3 fossular denticles), 129/63 and 178/61 (both with distinct zigzag lines), all with white extremities.

Cypraea succincta (306, 348)

According to HANLEY (1855, p. 189, pl. 5, figs. 1-2) the holotype is preserved in the Dronningen Museum at Uppsala; the figure shows a very young shell (with only few anterior columellar teeth developed as nodules), about 400/62, blackish with two pale narrow zones. Now I think it to be more probably a young shell of the Malayan *Erronea onyx* (see above) than of the more western race *adusta* (LAMARCK).

Cypraea ziczac (307, 349)

Neotype (no label): *Palmadusta ziczac,* 179/61 22:18, outer lip damaged during the animal's life and healed, fossula vertical, narrow, crossed by wedge-shaped ribs without inner denticles; dorsum with regular fulvous zigzag lines and four very narrow transverse zones, lateral and basal spots almost black, base rich orange.

Second shell: 209/60 22:18, differs by the zigzag lines between the two central zones becoming rather short and straight almost as it is in *misella* (PERRY), and by the right margin showing a blackish longitudinal band.

Two further shells (length 150 and 158) show the zigzag lines as in the neotype, but in the former shell (150) the lateral spots coalesce.

Cypraea hirundo (308, 350)

Neotype (no label): *Bistolida hirundo* (with the synonym *neglecta* SOWERBY), 149/59 21:18, teeth produced across three quarters of the base, fossula rather broad, concave, ribbed, the columellar sulcus is hardly less broad, with faint transverse ribs and distinct inner denticles; dorsum greyish blue, with a distinct pale S-shaped anterior lacuna, whereas the posterior transverse band is obsolete and the pale round spot above the anterior extremity is absent; the brown dorsal dots are obsolete and a central blotch is entirely absent, lateral spots small and scarce (twelve on the right margin), four blackish terminal spots well developed.

Two other shells (129/54 and 132/53) are rather similar, but the former is rather greyish purple.

No *hirundo* of SOWERBY (1837) is represented among Linnaeus' shells at all, so that renaming it *kieneri* by HIDALGO (1906) was justified.

Cypraea asellus (309, 351)

Neotype (no label): *Palmadusta asellus,* 182/55 18:15, right side slightly margined and obsoletely pitted, six posterior columellar teeth much produced and swollen at their outer end, fossula rather vertical, ribbed, with inner denticles, columellar sulcus shallow, ribbed, with nodules within too; the three dark dorsal zones are rather narrow, suffused with greyish lilac and bordered by reddish brown zones, and crossed by white lines.

Four other shells are rather similar: 131 (with very narrow zones), 136/54, 145, and 175 (with slightly broader zones).

Cypraea errones (310, 352)

Lectotype (label 22): *Erronea errones,* 272/56 13(+ a slight swelling behind):15, base flattened, aperture wide, fossula reduced; dorsum pale grey, hardly zonate, with crowded fulvous specks and a large central blotch, anterior extremity with two blackish spots (the right spot is rather large, the left smaller), a narrow marginal zone and the base are very pale yellowish white.

There are five other specimens which evidently have been added later on: 211, 246/57, 251, 256/55 (subjunior), and 256; they represent various varieties concerning the dorsal blotch, the terminal spots, and the color of the base, but all shells are typical *Erronea errones,* and no specimen of *ovum* (GMELIN) is represented among Linnaeus' specimens so that the renaming by IREDALE (1935) was unnecessary.

Cypraea cribraria (311, 353)

Neotype (no label): *Cribraria cribraria,* 255/59 22:21 (+ 2 denticles on the left wall of the posterior outlet), cylindrical, right side sharply margined, but slightly thickened, base callous, fossula and columellar sulcus regular, vertical, ribbed; dorsum reddish fulvous with regular large round lacunae, no dorsal line nor traces of lateral spots.

Two other shells are very similar: 202/55 (rather oblong-ovate) and 219/54 19:20 (base not callous, the damaged outer lip became healed by the animal).

Cypraea moneta (312, 354)

The label 312 in the box seems to refer to six specimens, but only one shell has a special label attached, and this shell should be regarded as

Lectotype (label 23): *Monetaria moneta,* 192/73 11:10, ecotype R (SCHILDER & SCHILDER, 1937, p. 1122), deltoidal, lateral tubercles low, aperture narrow, dilated in front, columellar teeth distinctly produced, but not tuberculate; the shell is rather worn, pierced behind the anterior extremity so that it evidently has been used as ornament by natives.

The other five shells (paralectotypes) represent different ecological varieties: 231/75 11:11 (ecotype RM, margins more callous, lateral and basal tubercles more accentuated, aperture narrow, orange ring distinct), 271/75 (ecotype M, similar to the preceding shell but the lateral tubercles become oblique ridges, ring vivid), 246/71 (ecotype ME, also similar, ring distinct though the shell is rather suffused with fulvous enamel), 164/70 (ecotype EC with the lateral and basal tubercles much projecting), and 168/66 11:10 (ecotype CR, margins callous, basal ribs short, not tuberculate, ring absent); all these shells look Malayan or Pacific, not Indian.

Cypraea annulus (314, 355)

Lectotype (label 314 in very old ink): *Monetaria annulus,* 255/73 15:13, ecotype A (see SCHILDER & SCHILDER, 1937, p. 1120), margins callous, base slightly

convex, aperture rather narrow, but dilated in front, teeth short; greyish fulvous, dorsal ring distinct; the shell evidently belongs to the Malayan race, but never can belong to the East African *camelorum* (Rochebrune).

Four other shells, *viz.* 215/60 (oblong), 225, 255 and 270 probably belong to the Malayan race also.

Cypraea caurica (313, 356)

Neotype (no label): *Erronea caurica,* 262/70 13:13, margins swollen, aperture rather narrow, slightly dilated in front, teeth crossing the base almost to the outer margin, posterior tip of the inner lip acuminate, fossula not concave, but crossed by strong ribs as it is in *E. pallida* (Gray), columella ribbed without any sulcus; dorsum slightly zonate, with pale reddish brown specks, but no central blotch, margins whitish with pale distant spots, base pale orange, teeth whitish. The shell recalls the Ceylonese race.

A second shell: 249/63 15:16 is rather similar, but with the margins less thickened, the aperture wider, and the teeth less produced; color very similar.

Three further shells, *viz.* 320/58 (calcified), 315/54, and 347/50, show a large dorsal blotch which has not been mentioned in Linnaeus' description; therefore they evidently came from another source.

Cypraea erosa (315, 357)

Lectotype (label 25): *Erosaria erosa,* 336/63 19:13, right margin broadly swollen so that the lateral pittings become obsolete, labial teeth crossing the lip, but columellar teeth restricted to the edge of the aperture, terminal ridge slit longitudinally, fossula with four inner denticles; dorsum reddish fulvous, with very small and rather close white specks, but hardly any brown spots, dorsal line bluish grey, the greyish lateral blotches are large, but the reddish brown lateral striae are hardly continued to the margins of the base.

Four other shells, *viz.* 220/61 and 280/59 (both without lateral blotches), 233/71 and 324/65 (calcified) are less callous so that the lateral pittings become well developed; they should not be regarded as paralectotypes.

Cypraea flaveola (320, 358)

Lectotype (no label): *Erosaria labrolineata* (Gaskoin), 139/59, brownish fulvous with distinct lateral spots, and

Paralectotype (no label) of the same dimensions 139/59, slightly calcified, reddish brown with obsolete lateral spots: both shells show white dorsal spots (without any dark centers nor rings), blackish lateral spots and four larger dark brown terminal spots, base white.

According to Hanley (1855, p. 193) these two shells were the only specimens among Linnaeus' nameless shells which agreed with the very short description of *flaveola* in 1758, and Linnaeus said to possess the species. Therefore there is no reason to reject the name *flaveola*: it must be used for the species also called *labrolineata* (Gaskoin, 1849), *helenae* (Roberts, 1869), and *nashi* Iredale (1931) by later writers. The specific name *flaveola* (Linnaeus, 1758) must be restored, as Reeve (1846) did, for art. 23 b of the rules cannot be applied against this procedure, since the name *flaveola* in the sense of Linnaeus' tenth edition (1758) has been used by several authors after Roberts (1885), *e.g.* by Abrard in 1946. The confusion arose from the fact that the more accurate description of *flaveola* published by Linnaeus in 1764 refers to another specimen (probably preserved in the Museum of "Ludovica Ulrica") which belongs to *helvola* (see below), but not to Linnaeus' type specimens of 1758.

Cypraea spurca (317, 359)

Neotype (no label): *Erosaria spurca,* 289/64 21:15, shape typical as in the Mediterranean specimens; dorsum reddish fulvous, the semilunar whitish spots rather confused, lateral spots and pittings dark brown, base bleached fulvous.

Four other shells (281, 282, 291, 298) are very similar to the neotype which is the central shell of the five specimens fixed on the wooden tray.

Cypraea stolida (318, 360)

Holotype (no label): *Bistolida stolida,* 199/53 20:17 (+ 1 denticle), cylindrical, columellar teeth produced (only the five anterior ones are short), fossula broad, ribbed, columellar sulcus ribbed in front and with a row of internal nodules in the rear; central dorsal blotch divided into two perforated parts (the right part of which is smaller) and not connected with the four rather obsolete lateral spots; teeth brown.

Though the dorsal blotch is separated, the shell evidently belongs to the Malayan race.

Cypraea helvola (316, 361)

Neotype (no label): *Erosaria helvola,* 212/76 16:14, rather broad, fossula with four denticles; dorsum with white specks and brown spots each covering about half the dorsal area, longitudinal lateral chestnut zones rather narrow, extremities pale purple, marginal edges and base orange.

Four other shells are rather different: 152/63 is a younger shell, in 176/75 (calcified) and 209/72 the white specks are prevalent, while in the oblong darker 246/62 20:17 the brown dorsal spots prevail.

Cypraea ocellata (319, 362)

Neotype (no label): *Erosaria ocellata,* 182/70 14:13, right margin swollen but pitted, base rather flattened; dorsum reddish fulvous, almost half of the white specks exhibit a dark center, lateral spots and basal striae reddish brown.

A second shell (198/65) is darker yellowish brown, and a third shell (206/63) shows a monstrosity consisting in the swelling of the columellar margin like that figured in the Journal of Conchology, volume 20, plate 9, figure 3 (1936).

Cypraea poraria (321, 363)

Lectotype (label 36 . . .): *Erosaria poraria,* 195/68 21:16, deltoidal with the extremities attenuated, fossula broad, concave, ribbed, columella smooth; dorsum reddish fulvous-brown, the pure white specks are about as numerous as the annulated ones, margins and base lilac, teeth white.

Three other shells (117/64, 190/67, 193/71) are very similar and evidently came from the same source. The deltoidal shape proves their coming from the Pacific, so that the eastern race *scarabaeus* (Bory, 1827) becomes a synonym of *poraria* and the ovate Indian race must be called *wilhelmina* (Kenyon, 1897).

Cypraea pediculus (322, 364)

The tray (no label) contains 14 specimens three of which cannot be determined as they are fixed by the dorsum; the remaining 11 shells belong to three species:

Neotype: *Pusula pediculus,* 146/73 20:21 (with 69 ribs around the shell and 28 ribs starting from the dorsal sulcus in all directions), the smooth, slightly sinuous dorsal sulcus is bordered by two rows of nodules (many dorsal ribs die out before they reach the sulcus), fossula broad and deep, columellar sulcus narrow, but regular; dorsum pale greyish with three pairs of dark blotches, margins pink, base greyish pink, columella white within.

Five other shells (109, 109, 113, 116, 135) are very similar in structure, but some of them are slightly paler: they belong to the East American *Pusula pediculus* also.

Four shells, however, belong to the West European *Trivia monacha* (Da Costa, 1778); 116 (with 34 dorsal ribs) and 104 exhibit three dark spots on the dorsum, and 91 (with 36 dorsal ribs) and 82 show two spots only. but in all four shells the dorsal sulcus is obsolete.

The last shell belongs to the anatomically different West European *Trivia arctica* (Montagu, 1803): 81.5 (with 31 dorsal ribs), dorsum unspotted, dorsal sulcus absent.

In 1767 Linnaeus separated these three species by the terms *indica* (= *pediculus*), *europaea* (= *monacha*) and *anglica* (= *arctica*); later writers disagreed as to whether these terms should be regarded as varietal names given by ternary nomenclature like those of the races of man, or only as geographical characteristics. Now I think them to be valid names: but *indica* becomes a synonym of *pediculus* in any case, and the other two varietal names should be rejected according to art. 23b of the Rules (waiting period of 50 years).

Cypraea nucleus (323, 365)

Lectotype (label 32 . . .): *Nuclearia nucleus,* 255/60 27:17 (two terminal ridges, two intermediate ribs, and three denticles on the rear excluded), hardly rostrate (body whorl without extremities = 205), dorsum with rather scarce small tubercles (connected by ribs) and a rather sinuous longitudinal sulcus, base ribbed (only one columellar rib does not attain the aperture), fossula broad, ribbed, columella ribbed only externally; unicolored dirty pale greyish.

Second shell: 197/59, very similar, dirty brownish grey.

Cypraea staphylaea (324, 366)

Neotype (no label): *Staphylaea staphylaea,* 155/61 22:16, extremities produced, dorsal granulation fine, longitudinal sulcus distinct, base crossed by ribs to the margins; dorsum yellowish brown, extremities brownish red, base pale brownish.

Three other shells, *viz.* 136/60, 139/69 (deformed), and 162/60 agree with the neotype in structure; their dorsum varies from greyish brown to chestnut.

Cypraea globulus (325, 367)

Three shells were fixed on the wooden tray originally, but the central one was missing in 1936; the shell showing the base should be regarded as

Neotype (no label): *Pustularia globulus,* 153/61 29 (three of which are within the outlets):17(+3 posterior denticles), subcylindrical, extremities short (the body whorl without extremities measures 123), dorsum smooth, labial teeth crossing $\frac{1}{2}$ lip in the center and $\frac{5}{6}$ lip behind, columellar teeth rather short in front and crossing $\frac{1}{3}$ lip in the center; dorsum orange fulvous, punctate with brown, but destitute of central blotches, base orange, without any trace of blotches, teeth brownish.

The second shell (dorsal view): 159/62 (body whorl 129) is very similar in shape and coloring.

Cypraea cicercula (326, 368)

Neotype (no label): *Pustularia bistrinotata* Schilder & Schilder (1937), 152/73 (body whorl without extremities 117), dorsum regularly convex (not humped), granulate (but top almost smooth), dorsal sulcus distinct,

anterior and posterior teeth of both lips more or less crossing the margins of the shell; dorsum bleached, now whitish, with very pale yellowish dorsal specks and three distinct yellowish blotches along the dorsal line, but basal blotches are not visible.

Second shell: 142/65 (body whorl 114), still more worn, but probably identical.

The dorsal blotches of the bleached neotype are very pale so that they evidently escaped LINNAEUS' observation, and he did not mention them in the description and quoted a figure of *staphylaea* which also has an unspotted dorsum; but HANLEY (1855, p. 198) possibly noticed the dorsal spots, as he referred *cicercula* to an illustration of SOWERBY (1836) which shows the dorsally spotted *bistrinotata*. Therefore, in future *bistrinotata* should be called *cicercula,* and the granulated unspotted whitish *cicercula* of various authors should be called *lienardi* (JOUSSEAUME, 1874).

Bulla ovum (327, 369)

Lectotype (label 327): *Ovula ovum,* 732/62, not fully grown as the extremities are less developed; inside brownish orange.

Second shell: 806/59, adult, inside orange brown, outer lip very pale pinkish white.

Bulla volva (328, 370)

Holotype (no label): *Volva volva,* 570/26 (anterior beak 122, posterior beak 188 so that the body whorl is only 260), subjunior, dorsum smooth (longitudinal lines of growth excepted), but the beaks show coarse spiral lines, outer lip yet hardly thickened, but distinctly undulate, posterior funiculum of the inner lip absent; bleached.

Bulla birostris (—, 371)

There are two shells marked as *birostris* by HANLEY which differ in shape, thickness of outer lip, and color; but LINNAEUS' accurate description fits one of them only, as HANLEY (1855, p. 200) also emphasized: therefore this shell must be regarded as

Holotype (no label): *Volva brevirostris* (SCHUMACHER, 1817), 281/36, outline of the shell (but not the funiculum!) recalling figure 73 in SCHILDER (1932), outer lip thickened, rounded, basally slightly undulate, aperture much dilated in front, fossula very narrow and shallow, striated, the interior carina indistinctly reaching the posterior funiculum which consists of two faint denticles; bleached, but evidently pinkish.

The other shell seems to be *Volva longirostrata* (SOWERBY, 1828): 282/22, recalling fig. 78 in SCHILDER (1932), therefore much more slender than the holotype, with the outer lip narrow, and the funiculum and fossula both totally absent; probably more whitish.

Therefore *Volva brevirostris* (SCHUMACHER, 1817) should be called *V. birostris* (LINNAEUS, 1767), and *V. birostris* SCHILDER (1932) should be called *V. longirostrata* (SOWERBY, 1828).

Bulla spelta (329, 372)

Lectotype (no label): *Simnia spelta,* 125/50, recalling figure 58 of SCHILDER (1932), but the interior carina is less distinct though it extends along the whole columella; whitish (bleached).

Five other specimens (82, 85, 101, 108, and 141/37) are juvenile stages of *Simnia spelta,* whitish, with the outer lip acute (not yet inflected), a distinct spiral anterior terminal ridge, an indistinct interior carina, and a posterior funiculum recalling fig. 51 of SCHILDER (1932); as LINNAEUS described the species "*margine incrassato*" these juveniles cannot be regarded as types.

As the lectotype is a very broad specimen of *Simnia spelta,* the variety *obsoleta* (LOCARD, 1892) must be regarded as a synonym.

Bulla verrucosa (330, 373)

Holotype (no label): *Calpurnus verrucosus,* 233/60, rather narrow and humped, dorsum finely striated, with a distinct transverse carina; bleached, as the pink color of the extremities is hardly discernible and the orange rings around the terminal tubercles are pale.

Bulla gibbosa (331, 374)

Neotype (no label): *Cyphoma gibbosa,* 218/60, dorsal carina prominent, outer lip rather narrow but both lips distinctly thickened behind, no traces of teeth, fossula broad, declivous, interior slightly carinate; bleached, but the margins evidently were pinkish orange.

Three other shells (191/61, 219/57, and 230/53) are similar, but colorless; 219/57 is not fully grown as the dorsal carina is less developed.

Bulla cypraea (0, 389)

Neotype (no label): *Erosaria spurca,* 168/55, oliviform stage (protoconch and almost three whorls), outer lip acute (not inflected), posterior extremity flattened, the small spire acutely protruding from this plane; pale fulvous, the posterior plane whitish, spire rich brownish purple.

Two other oliviform shells (137 and 174) are very similar, but their spire is pale flesh color.

Such juveniles could be interpreted as other species of *Erosaria* too, but as LINNAEUS indicated them to come

from the Mediterranean Sea, they must be interpreted as *E. spurca;* even LINNAEUS stated the synonymy in 1767 (page 1180).

Cypraea cervus (Mantissa, p. 584)

Holotype (no label): *Macrocypraea cervus,* 1130/55 48:38, spire short (6mm long), aperture wide, fossula reduced, columella without any distinct sulcus, ribbed in front, with internal nodules in the center, and smooth behind; chestnut, white spots small (especially those on the right margin), spots never ocellated.

Cypraea punctata (Mantissa p. 584)

Holotype (no label): *Notadusta punctata,* 136/55 21: 22, oblong-ovate, subpyriform, right side slightly margined, posterior extremity with a distinct callosity on the left, aperture slightly curved behind, outer lip declivous in front, labial teeth crossing one third of the lip, columellar teeth confined to the edge of the aperture, posterior tip of the inner lip slightly produced and slightly bent to the left, fossula narrow, rather concave, ribbed; dorsum greyish white, possibly slightly zonate with yellowish white, dorsal spots rather large and distant, lateral spots regular, but terminal spots obsolete (the left anterior spot excepted), base probably without yellow lines.

These characters prove the holotype to belong to the Malayan race called *atomaria* (GMELIN, 1791) in my previous papers.

ADDITIONAL REMARKS

In the last drawer of Linnaeus' cowries there were many specimens belonging to species which were unknown to Linnaeus, *viz. "Cypraea" aurantium* GMELIN, 1791, *camelopardalis* PERRY, 1811, *chinensis* GMELIN, 1791, *cinerea* GMELIN, 1791, *diluculum* REEVE, 1845, *interrupta* GRAY, 1824, *listeri* GRAY, 1824, *miliaris* GMELIN, 1791, *pantherina* SOLANDER, 1786, *pyrum* GMELIN, 1791, *turdus* LAMARCK, 1810, *zonaria* GMELIN, 1791 as well as two species belonging to *Pusula, viz. quadripunctata* (GRAY, 1827) and *suffusa* (GRAY, 1827). They evidently have been added later on, as Linnaeus' publications do not contain the descriptions of them; therefore they need no discussion in this paper.

DISCUSSION

The main question which arises from these investigations concerning the cowrie shells preserved in Linnaeus' cabinet in the Linnean Society of London are as follows:

1. Is science prepared to recognize the shells selected as holotypes, lectotypes,or neotypes to be formal type specimens according to art. 71 to 75 of the International Rules of Zoological Nomenclature (1958)?

2. Is the type specimen or the original description decisive, if there are differences between them? In cowries these differences refer never to the mostly short diagnoses of characters themselves, but only to the quotations of previous illustrations and to the indications of habitat mostly adopted from previous writers.

If, as I suppose, the first answer would be affirmative, and the type specimens have prevalence, the following important changes in nomenclature should take place:

Former Name	New Name
a) on the specific level	
Pustularia	
bistrinotata SCHILDER & SCHILDER	*cicercula* (LINNAEUS)
cicercula (LINNAEUS)	*lienardi* (JOUSSEAUME)
Erosaria	
labrolineata (GASKOIN)	*flaveola* (LINNAEUS)
Volva	
brevirostris (SCHUMACHER)	*birostris* (LINNAEUS)
birostris (LINNAEUS)	*longirostrata* (SOWERBY)
b) on the subspecific level	
Mauritia arabica	
dilacerata SCHILDER & SCHILDER	*arabica* (LINNAEUS)
arabica (LINNAEUS)	*intermedia* (GRAY)
Erronea onyx	
succincta (LINNAEUS)	*adusta* (LAMARCK)
Palmadusta punctata	
atomaria (GMELIN)	*punctata* (LINNAEUS)
punctata (LINNAEUS)	*berinii* (DAUTZENBERG)
Erosaria poraria	
scarabaeus (BORY)	*poraria* (LINNAEUS)
poraria (LINNAEUS)	*wilhelmina* (KENYON)
c) on synonymic level	
Mauritia	
histrio syn. *amethystea* (LINNAEUS)	
arabica syn. *amethystea* (LINNAEUS)	

But the following change should be rejected:

Trivia	
arctica (MONTAGU)	*anglica* (LINNAEUS)
monacha (DA COSTA)	*europaea* (LINNAEUS)

Some further changes of dubious regional "races" and of type localities are less important.

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